

Tuesday, 10/24/2006 10:54:28 AM
Kim Johnston

Process Sheet

Split - 1

Part Number : CU-DAR001 Dart Helicopters Services
 : 29120
 : 10386
 : N/A
 This Issue : 10/24/2006 S.O. No. : N/A
 Prsht Rev. : NC
 First Issue : N/A Type : MACHINED PARTS
 Previous Run : 25849
 Written By :
 Checked & Approved By :
 Comment : Est Rev: A New Issue 05-11-08 JLM

Drawing Name : BAR
 Part Number : D31961
 Drawing Number : D3196 UNDER REVIEW
 Project Number : N/A
 Drawing Revision : U/R
 Material : N/A
 Due Date : 11/10/2006 Qty: 5 Um: Each

Additional Product

Job Number:



Seq. #: Machine Or Operation: Description :

1.0 M6061T6B0750X01500 6061-T6 Bar .75" X 1.5"



Comment: Qty.: 2.2922 f(s)/Unit Total: 11.4608 f(s)
 Material: 6061-T6/T651 (QQ-A-200/8) or (QQ-A-225/8)
 (M6061T6B0.750x01.500)
 Identify for D3196-1
 Batch: M102947

ml 06/10/29

5

2.0 BAND SAW BAND-SAW



Comment: BAND SAW
 Cut blank: (0.75" x 1.50") x 26.200" long Bar

ml 06/10/29

5

3.0 HAAS1 HAAS CNC VERTICAL MACHINING #1



Comment: HAAS CNC VERTICAL MACHINING #1

1-Machine D3196-1 as per Folio FA339 and Dwg D3196 Identify as D3196-1

2-Deburr

J.F. 06/10/31

5

4.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

J.F. 06/10/31

5

5.0 QC8 SECOND CHECK




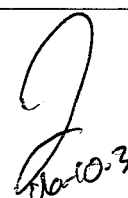


Comment: SECOND CHECK

SD 06.10.31

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes ☒ No ☐ DQA: 2D Date: 06/11/10
 QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
06/10/31	3	C'sink $\phi 6.700 \times 100^\circ$ on one part.	 06/10/31 PV Q51042	PART IS OK BECAUSE MARGIN OF SAFETY STILL POSITIVE, SEE ATTACHED SHEET		 06/10/31	 06/10/31 PV Q51042	 06/10/31

NOTE: Date & initial all entries

Date: Tuesday, 10/24/2006 10:54:29 AM
User: Kim Johnston

Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BAR

Job Number: 29120

Part Number: D31961

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

y 06/11/01 x 5

7.0

POWDER COATING

POWDER COATING



Comment: POWDER COATING

Powder Coat Grey Sandtex (Ref: 4.3.5.6) as per QSI 005 4.3

M 19720

an 06/11/02 (5)

8.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

LS06/11/02 (4)

9.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and Stock

Location:

ST134

B 06/11/04 (4)

10.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

06/11/10 (4)

Job Completion



u 06-11-10

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

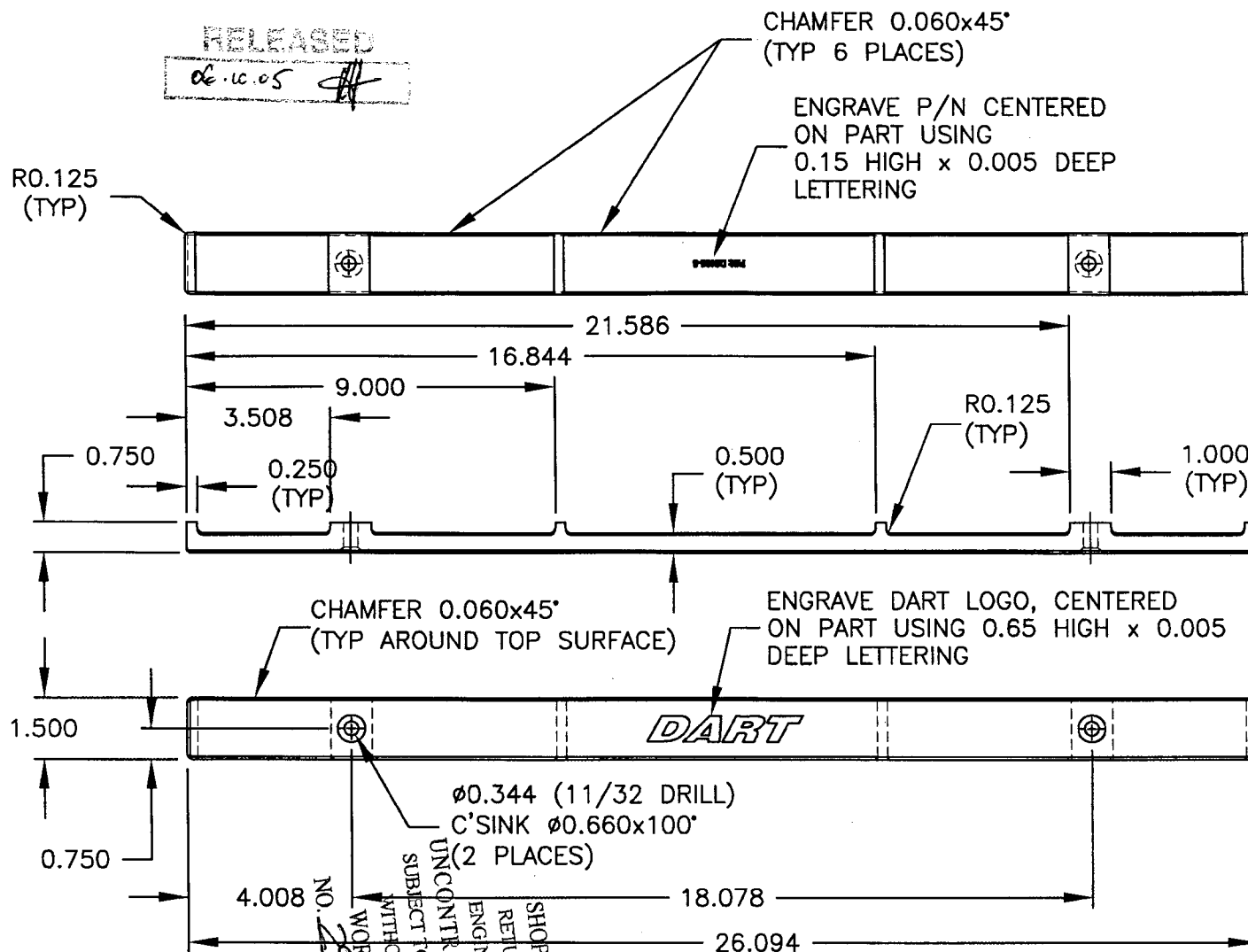
Part No: _____ PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ : Date: _____
 QA: N/C Closed: _____ Date: _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

DART

DESIGN	06	DRAWN BY	06	DART AEROSPACE LTD
CHECKED	06	APPROVED	06	HAWKESBURY, ONTARIO, CANADA
DATE	06.09.25	TITLE	BAR	REV. B
		DRAWING NO.	D3196	SHEET 4 OF 4
		SCALE	1:4	

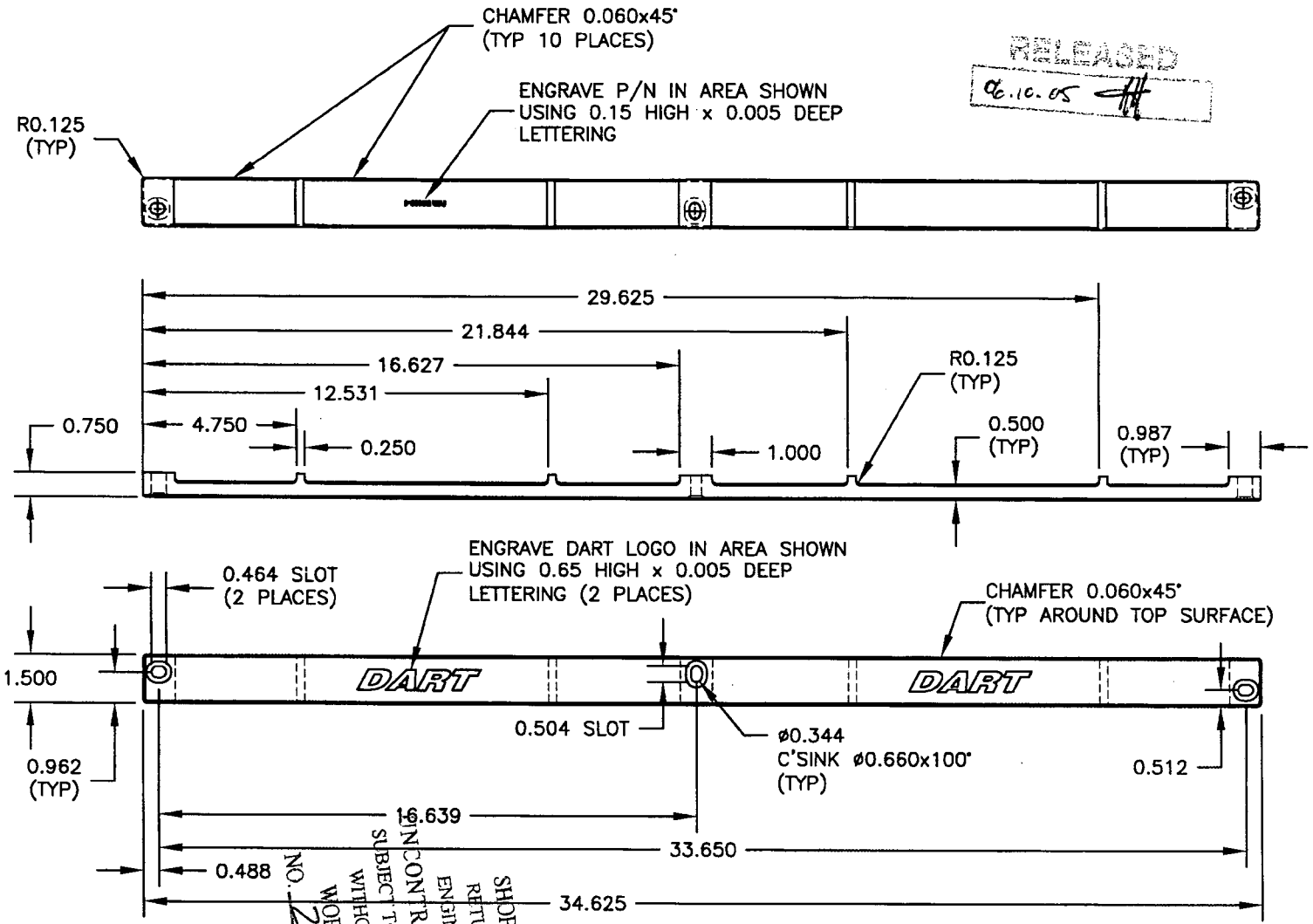


D3196-5 BAR

- 1) MATERIAL: 6061-T6/T651 ALUMINUM (QQ-A-200/8 OR QQ-A-225/8)
(REF DART SPEC. M6061T6B)
- 2) BREAK ALL SHARP EDGES 0.005 TO 0.010
- 3) FINISH: POWDER COAT GREY SANDTEX (4.3.5.6) PER DART QSI 005 4.3
- 4) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- 5) ALL DIMENSIONS ARE IN INCHES



DESIGN	QC	DRAWN BY	JR	DART AEROSPACE LTD
CHECKED		APPROVED		HAWKESBURY, ONTARIO, CANADA
DATE	06.09.25	DRAWING NO.	D3196	REV. B
		TITLE	BAR	SHEET 3 OF 4
				SCALE 1:5



D3196-4 BAR

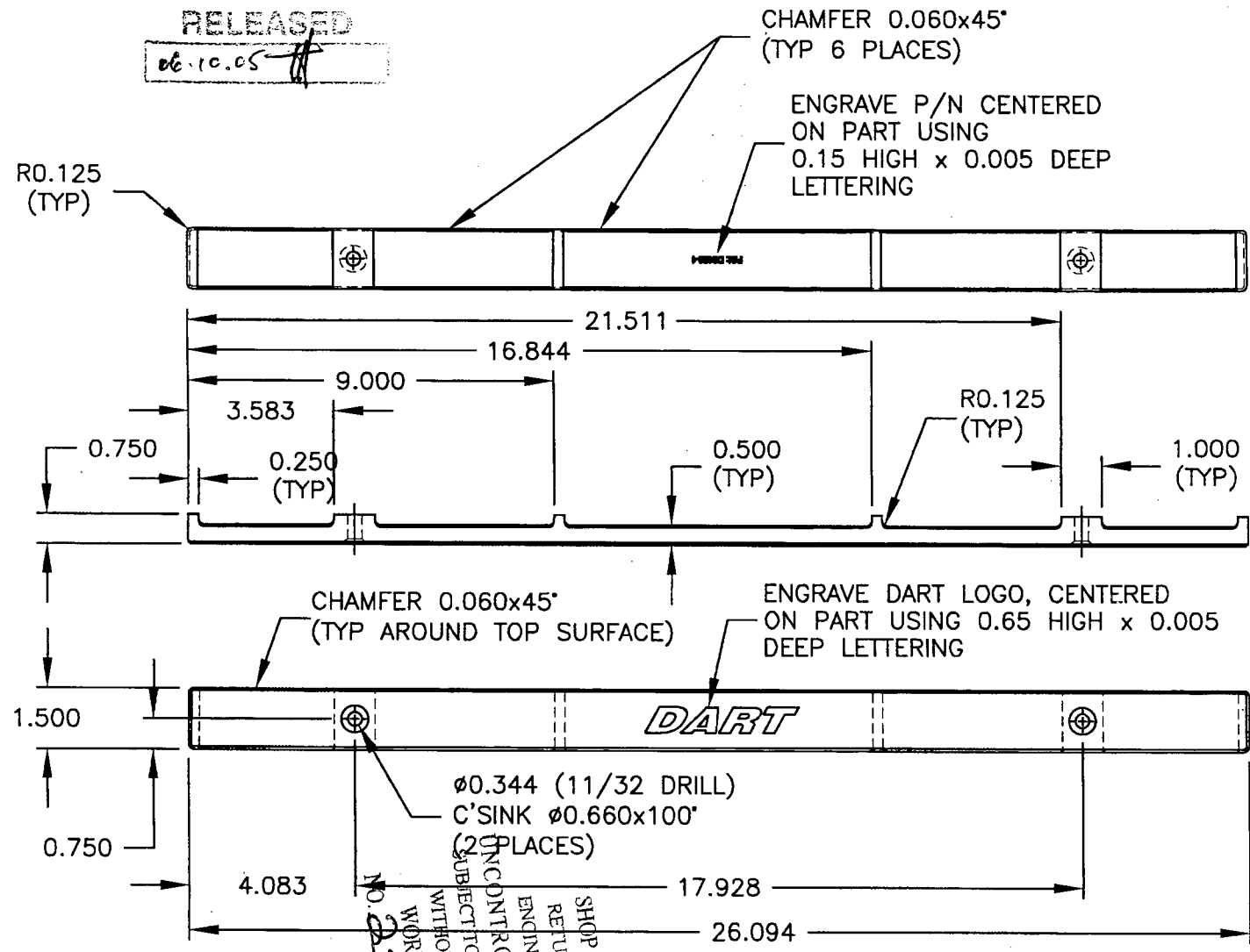
- 1) MATERIAL: 6061-T6/T651 ALUMINUM (QQ-A-200/8 OR QQ-A-225/8)
(REF DART SPEC. M6061T6B)
- 2) BREAK ALL SHARP EDGES 0.005 TO 0.010
- 3) FINISH: POWDER COAT GREY SANDTEX (4.3.5.6) PER DART QSI 005 4.3
- 4) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- 5) ALL DIMENSIONS ARE IN INCHES

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DESIGN	DRAWN BY	DART AEROSPACE LTD	REV. B
CHECKED	APPROVED	DRAWING NO.	HAWKESBURY, ONTARIO, CANADA
DATE		D3196	SHEET 1 OF 4
06.09.25		BAR	SCALE
A	03.06.25	NEW ISSUE	1:4
B	06.09.25	ADD D3196-5	



D3196-1 BAR

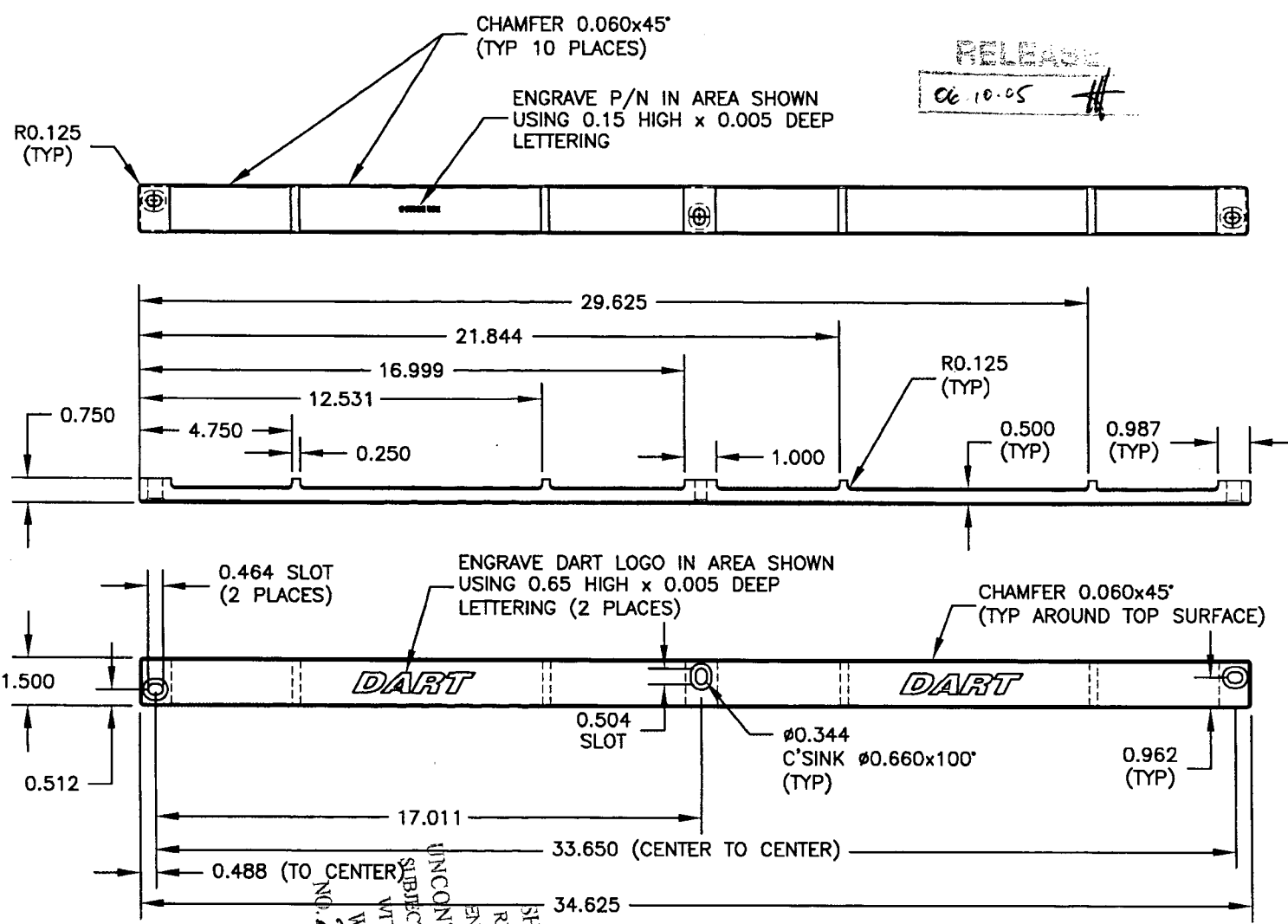
- 1) MATERIAL: 6061-T6/T651 ALUMINUM 400-A-200/8 OR QQ-A-225/8)
(REF DART SPEC. M6061T6B)
- 2) BREAK ALL SHARP EDGES 0.005 TO 0.010
- 3) FINISH: POWDER COAT GREY SANDTEX (4.3.5.6) PER DART QSI 005 4.3
- 4) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
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DESIGN	90	DRAWN BY		DART AEROSPACE LTD
CHECKED		APPROVED		HAWKESBURY, ONTARIO, CANADA
DATE	06.09.25	TITLE	BAR	REV. B
		DRAWING NO.	D3196	SHEET 2 OF 4
		SCALE	1:5	



D3196-3 BAR

- 1) MATERIAL: 6061-T6/T651 ALUMINUM QQ-A-200/8 OR QQ-A-225/8 (REF DART SPEC. M6061T6B)
- 2) BREAK ALL SHARP EDGES 0.005 TO 0.010
- 3) FINISH: POWDER COAT GREY SANDTEX (4.3.5.6) PER DART QSI 005 4.3
- 4) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- 5) ALL DIMENSIONS ARE IN INCHES

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4.0 Analysis4.1 D3196-1/-3/-4 Bar Analysis4.1.1 D3196-1 Bar Bending Failure

The loading of the D3196-1 Bar is shown in Figure 1 of Appendix B. The worst case loading is the 16 g forward acting load because the magnitude of the load is higher and the section is smaller in the fwd-aft direction (16g) than it is in the up-down direction (4g).

$$b := 1.50 \cdot \text{in}$$

$$t := 0.50 \cdot \text{in} \quad \underline{0.750}$$

$$k := 1.5$$

$$M := 2048 \cdot \text{in} \cdot \text{lb}$$

$$M = 2048 \cdot \text{in} \cdot \text{lb}$$

$$I := \frac{1}{12} \cdot b \cdot t^3$$

$$I = 0.01563 \cdot \text{in}^4 \quad \underline{0.0377} \quad \text{Inertia of cross section}$$

(AutoCAD)

$$F_{bu1} := F_{tu1} + F_{ol} \cdot (k - 1)$$

$$F_{bu1} = 48911 \cdot \text{psi}$$

Width of Section in Bending
Thickness of Section in Bending

Shape Factor (Bruhn C3.3)

Maximum Ultimate Bending Moment

Inertia of cross section

Modulus of Rupture (Bruhn C3.11)

$$M_u := F_{bu1} \cdot \frac{2 \cdot I}{t}$$

$$M_u = 3057 \cdot \text{in} \cdot \text{lb}$$

Allowable Bending Moment (Ultimate)

$$MS := \frac{M_u}{M} - 1$$

$$MS = 0.49$$

Margin of Safety (Ultimate)

4.1.2 D3196-3/-4 Bar Bending Failure

The loading of the D3196-3/-4 Bar is shown in Figure 2 of Appendix B. The worst case loading is the 8g sideways acting load because the magnitude of the load is higher and the section is smaller in the lateral direction (8g) than it is in the up-down direction (4g).

$$b := 1.50 \cdot \text{in}$$

$$t := 0.375 \cdot \text{in}$$

$$k := 1.5$$

$$M := 1180 \cdot \text{in} \cdot \text{lb}$$

$$M = 1180 \cdot \text{in} \cdot \text{lb}$$

$$I := \frac{1}{12} \cdot b \cdot t^3$$

$$I = 0.00659 \cdot \text{in}^4$$

Width of Section in Bending

Thickness of Section in Bending

Shape Factor (Bruhn C3.3)

Maximum Ultimate Bending Moment

Inertia of cross section

$$F_{bu1} := F_{tu1} + F_{ol} \cdot (k - 1)$$

$$F_{bu1} = 48911 \cdot \text{psi}$$

Modulus of Rupture (Bruhn C3.11)

$$M_u := F_{bu1} \cdot \frac{2 \cdot I}{t}$$

$$M_u = 1720 \cdot \text{in} \cdot \text{lb}$$

Allowable Bending Moment (Ultimate)

$$MS := \frac{M_u}{M} - 1$$

$$MS = 0.46$$

Margin of Safety (Ultimate)

Inertia of bar
Holes still larger
than min section
even with $\phi 700 \times 100^\circ$
Countersink.

$$I = 0.0377 \cdot \text{in}^4$$

(AutoCAD)

$$> I = 0.01563$$

$$= 1.4 \quad \text{OK}$$